

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listing, of claims in the application:

1. (Original) A method for preparing microcapsules comprising the steps of:

(a) mixing a free-radically polymerizable and ethylenically unsaturated monomer, an emulsifier, an ultrahydrophobe, a hydrophobic material, an initiator and deionized water, to prepare a miniemulsion; and

(b) polymerizing the miniemulsion to prepare the microcapsules.

2. (Original) A method for preparing microcapsules comprising the steps of:

(a) mixing a free-radically polymerizable and ethylenically unsaturated monomer, an emulsifier, an ultrahydrophobe, a hydrophobic material, a crosslinking agent, an initiator and deionized water, to prepare a miniemulsion; and

(b) polymerizing the miniemulsion to prepare the microcapsules.

3. (Original) A method for preparing microcapsules comprising the steps of:

(a) mixing a free-radically polymerizable and ethylenically unsaturated monomer, an emulsifier, an ultrahydrophobe, a hydrophobic material, an initiator and deionized water, to prepare a miniemulsion; and

(b) adding a crosslinking agent during polymerizing the miniemulsion to prepare the microcapsules.

4. (Original) A method for preparing microcapsules comprising the steps of:

(a) mixing a free-radically polymerizable and ethylenically unsaturated monomer, an emulsifier, an ultrahydrophobe, a hydrophobic material, a hydrophilic comonomer, a crosslinking agent, an oil-soluble initiator and deionized water, to prepare a miniemulsion;

(b) polymerizing the miniemulsion to prepare the microcapsules.

5. (Original) A method for preparing microcapsules comprising the steps of:

- (a) mixing a free-radically polymerizable and ethylenically unsaturated monomer, an emulsifier, an ultrahydrophobe, a hydrophobic material, a hydrophilic comonomer, a crosslinking agent, an oil-soluble initiator and deionized water, to prepare a miniemulsion;
- (b) polymerizing the miniemulsion; and
- (c) adding a secondary initiator during the polymerization.

6. (Currently Amended) The method of ~~any one of claims 1 through 5~~, wherein the hydrophobic material is compatible with the free-radically polymerizable and ethylenically unsaturated monomer and incompatible with a polymer constituting final shells of the microcapsules, and an interfacial tension between the hydrophobic material and water is larger than that between the polymer and water.

7. (Currently Amended) The method of claim 6, wherein the hydrophobic material is one or more selected from the group consisting of aliphatic and aromatic hydrocarbons of $C_4 \sim C_{20}$ and isomers thereof, aliphatic and aromatic alcohols of $C_{10} \sim C_{20}$, aliphatic and aromatic esters of $C_{10} \sim C_{20}$, aliphatic and aromatic esters of $C_{10} \sim C_{20}$, silicone oils, natural and synthetic oils.

8. (Original) The method of claim 1, wherein in step (a), the emulsifier is used in an amount of 0.01 to 5.0 parts by weight, the ultrahydrophobe in an amount of 0.1 to 10 parts by weight, the hydrophobic material in an amount of 10 to 300 parts by weight, and the initiator in an amount of 0.01 to 3 parts by weight, based on 100 parts by weight of the free-radically polymerizable and ethylenically unsaturated monomer.

9. (Currently Amended) The method of claim 2-~~or 3~~, wherein the emulsifier is used in an amount of 0.01 to 5.0 parts by weight, the ultrahydrophobe in an amount of 0.1 to 10 parts by weight, the hydrophobic material in an amount of 10 to 300 parts by weight, the crosslinking agent in an amount of 0.1 to 10 parts by weight, and the initiator in an amount of 0.01 to 3 parts by weight, based on 100 parts by weight of the free-radically polymerizable and ethylenically unsaturated monomer.

10. (Currently Amended) The method of claim 4 or 5, wherein the emulsifier is used in an amount of 0.01 to 5.0 parts by weight, the ultrahydrophobe in an amount of 0.1 to 10 parts by weight, the hydrophilic comonomer in an amount of 0.1 to 10 parts by weight, the hydrophobic material in an amount of 10 to 300 parts by weight, the crosslinking agent in an amount of 0.1 to 10 parts by weight, the oil-soluble initiator in an amount of 0.01 to 3 parts by weight, and the secondary initiator in an amount of 0.01 to 1 part by weight, based on 100 parts by weight of the free-radically and polymerizable ethylenically unsaturated monomer.

11. (Currently Amended) The method of ~~any one of claims 1 through 5~~, wherein polymerizing the miniemulsion is performed at a temperature of 25 to 160°C for 3 to 24 hours.

12. (Currently Amended) The method of ~~any one of claims 1 through 5~~, wherein the free-radically polymerizable and ethylenically unsaturated monomer is one or more selected from the group consisting of methacrylate derivatives, acrylate derivatives, acrylic acid derivatives, methacrylonitriles, ethylenes, butadienes, isoprenes, styrenes, styrene derivatives, acrylonitrile derivatives, vinylester derivatives, and halogenated vinyl derivatives, and mercaptan derivatives.

13. (Currently Amended) The method of ~~any one of claims 1 through 5~~, wherein the emulsifier is one or more selected from the group consisting of a nonionic emulsifier, a cationic emulsifier, an anionic emulsifier and an amphiphilic emulsifier.

14. (Currently Amended) The method of ~~any one of claims 1 through 5~~, wherein the ultrahydrophobe is a strong hydrophobic material having solubility of 5×10^{-6} g/kg or less in 25°C water

15. (Currently Amended) The method of claim 14, wherein the ultrahydrophobe is one or more selected from the group consisting of aliphatic hydrocarbons of C₁₂—C₂₀, aliphatic alcohols of C₁₂—C₂₀, alkylacrylates of C₁₂—C₂₀, alkyl mercaptans of C₁₂—C₂₀,

organic dyes, fluorinated alkanes, silicone oils, natural and synthetic oils, oligomers with a molecular weight of 1,000 to 500,000, and polymers with a molecular weight of 1,000 to 500,000.

16. (Currently Amended) The method of ~~any one of~~ claims 2-through-5, wherein the crosslinking agent is a monomer having two or more unsaturated bonds copolymerizable with the free-radically polymerizable and ethylenically unsaturated monomer.

17. (Original) The method of claim 16, wherein the crosslinking agent is one or more selected from the group consisting of allyl methacrylate, ethylene glycol dimethacrylate, ethylene glycol diacrylate, butanediol diacrylate, butanediol dimethacrylate, neopentyl glycol dimethacrylate, hexanediol dimethacrylate, triethylene glycol dimethacrylate, tetraethylene glycol dimethacrylate, trimethylolpropane trimethacrylate, pentaerythritol tetramethacrylate, and divinylbenzene.

18. (Currently Amended) The method of ~~any one of~~ claims 1-through-3, wherein the initiator is one or more selected from the group consisting of peroxides, persulfates, azo compounds, and redox compounds.

19. (Currently Amended) The method of claim 4-or-5, wherein the oil-soluble initiator is a material having solubility of 0.5 g/kg or less in 25 °C water.

20. (Original) The method of claim 19, wherein the oil-soluble initiator is selected from the group consisting of peroxides, persulfates, azo compounds, and redox compounds.

21. (Currently Amended) The method of claim 4-or-5, wherein the hydrophilic comonomer is copolymerizable with the free-radically polymerizable and ethylenically unsaturated monomer to increase hydrophilicity of a polymer produced by copolymerization with the free-radically polymerizable and ethylenically unsaturated

monomer so that the hydrophobic material used as a core material is stably positioned within a shell made of the polymer.

22. (Original) The method of claim 21, wherein the hydrophilic comonomer is one or more selected from unsaturated carboxylic acids selected from the group consisting of acrylic acid, methacrylic acid, itaconic acid, crotonic acid, fumaric acid and maleic acid; and unsaturated polycarboxylic acid alkyl esters having at least one carboxyl group selected from the group consisting of itaconic acid monoethyl ester, fumaric acid monobutyl ester and maleic acid monobutyl ester.

23. (Original) The method of claim 5, wherein the secondary initiator is one or more selected from the group consisting of peroxides, persulfates, azo compounds, and redox compounds.

24. (Original) The method of claim 5, wherein the secondary initiator is added when a monomer to polymer conversion is 50 to 95%.

25. (Original) The method of claim 3, wherein the crosslinking agent is added when a monomer to polymer conversion is 20 to 90%.

26. (Currently Amended) Microcapsules prepared by the method of ~~any one of~~ claims 1 through 25.

27. (Original) The microcapsules of claim 26, wherein the microcapsules are composed of 10 to 80 % by volume of a core made of the hydrophobic material, based on the total volume of the microcapsules, and a polymer shell surrounding the core, and have a particle size of 100 to 2,500 nm.

28. (Original) The microcapsules of claim 26, wherein the microcapsules are hollow, gas-filled microcapsules in which the hydrophobic material is removed.

29. (New) The method of claim 2, wherein the hydrophobic material is compatible with the free-radically polymerizable and ethylenically unsaturated monomer and incompatible with a polymer constituting final shells of the microcapsules, and an interfacial tension between the hydrophobic material and water is larger than that between the polymer and water.

30. (New) The method of claim 3, wherein the hydrophobic material is compatible with the free-radically polymerizable and ethylenically unsaturated monomer and incompatible with a polymer constituting final shells of the microcapsules, and an interfacial tension between the hydrophobic material and water is larger than that between the polymer and water.

31. (New) The method of claim 4, wherein the hydrophobic material is compatible with the free-radically polymerizable and ethylenically unsaturated monomer and incompatible with a polymer constituting final shells of the microcapsules, and an interfacial tension between the hydrophobic material and water is larger than that between the polymer and water.

32. (New) The method of claim 5, wherein the hydrophobic material is compatible with the free-radically polymerizable and ethylenically unsaturated monomer and incompatible with a polymer constituting final shells of the microcapsules, and an interfacial tension between the hydrophobic material and water is larger than that between the polymer and water.

33. (New) The method of claim 29, wherein the hydrophobic material is one or more selected from the group consisting of aliphatic and aromatic hydrocarbons of C₄ - C₂₀ and isomers thereof, aliphatic and aromatic alcohols of C₁₀ -C₂₀, aliphatic and aromatic esters of C₁₀ -C₂₀, aliphatic and aromatic esters of C₁₀ -C₂₀, silicone oils, natural and synthetic oils.

34. (New) The method of claim 30, wherein the hydrophobic material is one or more selected from the group consisting of aliphatic and aromatic hydrocarbons of C₄ - C₂₀ and isomers thereof, aliphatic and aromatic alcohols of C₁₀ -C₂₀, aliphatic and aromatic esters of C₁₀ -C₂₀, aliphatic and aromatic esters of C₁₀ -C₂₀, silicone oils, natural and synthetic oils.

35. (New) The method of claim 31, wherein the hydrophobic material is one or more selected from the group consisting of aliphatic and aromatic hydrocarbons of C₄ - C₂₀ and isomers thereof, aliphatic and aromatic alcohols of C₁₀ -C₂₀, aliphatic and aromatic esters of C₁₀ -C₂₀, aliphatic and aromatic esters of C₁₀ -C₂₀, silicone oils, natural and synthetic oils.

36. (New) The method of claim 32, wherein the hydrophobic material is one or more selected from the group consisting of aliphatic and aromatic hydrocarbons of C₄ - C₂₀ and isomers thereof, aliphatic and aromatic alcohols of C₁₀ -C₂₀, aliphatic and aromatic esters of C₁₀ -C₂₀, aliphatic and aromatic esters of C₁₀ -C₂₀, silicone oils, natural and synthetic oils.

37. (New) The method of claim 3, wherein the emulsifier is used in an amount of 0.01 to 5.0 parts by weight, the ultrahydrophobe in an amount of 0.1 to 10 parts by weight, the hydrophobic material in an amount of 10 to 300 parts by weight, the crosslinking agent in an amount of 0.1 to 10 parts by weight, and the initiator in an amount of 0.01 to 3 parts by weight, based on 100 parts by weight of the free-radically polymerizable and ethylenically unsaturated monomer.

38. (New) The method of claim 5, wherein the emulsifier is used in an amount of 0.01 to 5.0 parts by weight, the ultrahydrophobe in an amount of 0.1 to 10 parts by weight, the hydrophilic comonomer in an amount of 0.1 to 10 parts by weight, the hydrophobic material in an amount of 10 to 300 parts by weight, the crosslinking agent in an amount of 0.1 to 10 parts by weight, the oil-soluble initiator in an amount of 0.01 to 3 parts by weight, and the secondary initiator in an amount of 0.01 to 1 part by weight,

based on 100 parts by weight of the free-radically and polymerizable ethylenically unsaturated monomer.

39. (New) The method of claim 2, wherein polymerizing the miniemulsion is performed at a temperature of 25 to 160°C for 3 to 24 hours.

40. (New) The method of claim 3, wherein polymerizing the miniemulsion is performed at a temperature of 25 to 160°C for 3 to 24 hours.

41. (New) The method of claim 4, wherein polymerizing the miniemulsion is performed at a temperature of 25 to 160°C for 3 to 24 hours.

42. (New) The method of claim 5, wherein polymerizing the miniemulsion is performed at a temperature of 25 to 160°C for 3 to 24 hours.

43. (New) The method of claim 2, wherein the free-radically polymerizable and ethylenically unsaturated monomer is one or more selected from the group consisting of methacrylate derivatives, acrylate derivatives, acrylic acid derivatives, methacrylonitriles, ethylenes, butadienes, isoprenes, styrenes, styrene derivatives, acrylonitrile derivatives, vinylester derivatives, and halogenated vinyl derivatives, and mercaptan derivatives.

44. (New) The method of claim 3, wherein the free-radically polymerizable and ethylenically unsaturated monomer is one or more selected from the group consisting of methacrylate derivatives, acrylate derivatives, acrylic acid derivatives, methacrylonitriles, ethylenes, butadienes, isoprenes, styrenes, styrene derivatives, acrylonitrile derivatives, vinylester derivatives, and halogenated vinyl derivatives, and mercaptan derivatives.

45. (New) The method of claim 4, wherein the free-radically polymerizable and ethylenically unsaturated monomer is one or more selected from the group consisting of methacrylate derivatives, acrylate derivatives, acrylic acid derivatives, methacrylonitriles,

ethylenes, butadienes, isoprenes, styrenes, styrene derivatives, acrylonitrile derivatives, vinylester derivatives, and halogenated vinyl derivatives, and mercaptan derivatives.

46. (New) The method of claim 5, wherein the free-radically polymerizable and ethylenically unsaturated monomer is one or more selected from the group consisting of methacrylate derivatives, acrylate derivatives, acrylic acid derivatives, methacrylonitriles, ethylenes, butadienes, isoprenes, styrenes, styrene derivatives, acrylonitrile derivatives, vinylester derivatives, and halogenated vinyl derivatives, and mercaptan derivatives.

47. (New) The method of claim 2, wherein the emulsifier is one or more selected from the group consisting of a nonionic emulsifier, a cationic emulsifier, an anionic emulsifier and an amphiphilic emulsifier.

48. (New) The method of claim 3, wherein the emulsifier is one or more selected from the group consisting of a nonionic emulsifier, a cationic emulsifier, an anionic emulsifier and an amphiphilic emulsifier.

49. (New) The method of claim 4, wherein the emulsifier is one or more selected from the group consisting of a nonionic emulsifier, a cationic emulsifier, an anionic emulsifier and an amphiphilic emulsifier.

50. (New) The method of claim 5, wherein the emulsifier is one or more selected from the group consisting of a nonionic emulsifier, a cationic emulsifier, an anionic emulsifier and an amphiphilic emulsifier.

51. (New) The method of claim 2, wherein the ultrahydrophobe is a strong hydrophobic material having solubility of 5×10^{-6} g/kg or less in 25°C water

52. (New) The method of claim 3, wherein the ultrahydrophobe is a strong hydrophobic material having solubility of 5×10^{-6} g/kg or less in 25°C water

53. (New) The method of claim 4, wherein the ultrahydrophobe is a strong hydrophobic material having solubility of 5×10^{-6} g/kg or less in 25°C water

54. (New) The method of claim 5, wherein the ultrahydrophobe is a strong hydrophobic material having solubility of 5×10^{-6} g/kg or less in 25°C water

55. (New) The method of claim 51, wherein the ultrahydrophobe is one or more selected from the group consisting of aliphatic hydrocarbons of C₁₂-C₂₀, aliphatic alcohols of C₁₂-C₂₀, alkylacrylates of C₁₂-C₂₀, alkyl mercaptans of C₁₂-C₂₀, organic dyes, fluorinated alkanes, silicone oils, natural and synthetic oils, oligomers with a molecular weight of 1,000 to 500,000, and polymers with a molecular weight of 1,000 to 500,000.

56. (New) The method of claim 52, wherein the ultrahydrophobe is one or more selected from the group consisting of aliphatic hydrocarbons of C₁₂-C₂₀, aliphatic alcohols of C₁₂-C₂₀, alkylacrylates of C₁₂-C₂₀, alkyl mercaptans of C₁₂-C₂₀, organic dyes, fluorinated alkanes, silicone oils, natural and synthetic oils, oligomers with a molecular weight of 1,000 to 500,000, and polymers with a molecular weight of 1,000 to 500,000.

57. (New) The method of claim 53, wherein the ultrahydrophobe is one or more selected from the group consisting of aliphatic hydrocarbons of C₁₂-C₂₀, aliphatic alcohols of C₁₂-C₂₀, alkylacrylates of C₁₂-C₂₀, alkyl mercaptans of C₁₂-C₂₀, organic dyes, fluorinated alkanes, silicone oils, natural and synthetic oils, oligomers with a molecular weight of 1,000 to 500,000, and polymers with a molecular weight of 1,000 to 500,000.

58. (New) The method of claim 54, wherein the ultrahydrophobe is one or more selected from the group consisting of aliphatic hydrocarbons of C₁₂-C₂₀, aliphatic alcohols of C₁₂-C₂₀, alkylacrylates of C₁₂-C₂₀, alkyl mercaptans of C₁₂-C₂₀, organic dyes, fluorinated alkanes, silicone oils, natural and synthetic oils, oligomers with a

molecular weight of 1,000 to 500,000, and polymers with a molecular weight of 1,000 to 500,000.

59. (New) The method of claim 3, wherein the crosslinking agent is a monomer having two or more unsaturated bonds copolymerizable with the free-radically polymerizable and ethylenically unsaturated monomer.

60. (New) The method of claim 4, wherein the crosslinking agent is a monomer having two or more unsaturated bonds copolymerizable with the free-radically polymerizable and ethylenically unsaturated monomer.

61. (New) The method of claim 5, wherein the crosslinking agent is a monomer having two or more unsaturated bonds copolymerizable with the free-radically polymerizable and ethylenically unsaturated monomer.

62. (New) The method of claim 59, wherein the crosslinking agent is one or more selected from the group consisting of allyl methacrylate, ethylene glycol dimethacrylate, ethylene glycol diacrylate, butanediol diacrylate, butanediol dimethacrylate, neopentyl glycol dimethacrylate, hexanediol dimethacrylate, triethylene glycol dimethacrylate, tetraethylene glycol dimethacrylate, trimethylolpropane trimethacrylate, pentaerythritol tetramethacrylate, and divinylbenzene.

63. (New) The method of claim 60, wherein the crosslinking agent is one or more selected from the group consisting of allyl methacrylate, ethylene glycol dimethacrylate, ethylene glycol diacrylate, butanediol diacrylate, butanediol dimethacrylate, neopentyl glycol dimethacrylate, hexanediol dimethacrylate, triethylene glycol dimethacrylate, tetraethylene glycol dimethacrylate, trimethylolpropane trimethacrylate, pentaerythritol tetramethacrylate, and divinylbenzene.

64. (New) The method of claim 61, wherein the crosslinking agent is one or more selected from the group consisting of allyl methacrylate, ethylene glycol dimethacrylate,

ethylene glycol diacrylate, butanediol diacrylate, butanediol dimethacrylate, neopentyl glycol dimethacrylate, hexanediol dimethacrylate, triethylene glycol dimethacrylate, tetraethylene glycol dimethacrylate, trimethylolpropane trimethacrylate, pentaerythritol tetramethacrylate, and divinylbenzene.

65. (New) The method of claim 2, wherein the initiator is one or more selected from the group consisting of peroxides, persulfates, azo compounds, and redox compounds.

66. (New) The method of claim 3, wherein the initiator is one or more selected from the group consisting of peroxides, persulfates, azo compounds, and redox compounds.

67. (New) The method of claim 5, wherein the oil-soluble initiator is a material having solubility of 0.5 g/kg or less in 25 °C water.

68. (New) The method of claim 67, wherein the oil-soluble initiator is selected from the group consisting of peroxides, persulfates, azo compounds, and redox compounds.

69. (New) The method of claim 5, wherein the hydrophilic comonomer is copolymerizable with the free-radically polymerizable and ethylenically unsaturated monomer to increase hydrophilicity of a polymer produced by copolymerization with the free-radically polymerizable and ethylenically unsaturated monomer so that the hydrophobic material used as a core material is stably positioned within a shell made of the polymer.

70. (New) The method of claim 69, wherein the hydrophilic comonomer is one or more selected from unsaturated carboxylic acids selected from the group consisting of acrylic acid, methacrylic acid, itaconic acid, crotonic acid, fumaric acid and maleic acid; and unsaturated polycarboxylic acid alkyl esters having at least one carboxyl group

selected from the group consisting of itaconic acid monoethyl ester, fumaric acid monobutyl ester and maleic acid monobutyl ester.

71. (New) Microcapsules prepared by the method of claim 2.

72. (New) Microcapsules prepared by the method of claim 3.

73. (New) Microcapsules prepared by the method of claim 4.

74. (New) Microcapsules prepared by the method of claim 5.

75. (New) The microcapsules of claim 71, wherein the microcapsules are composed of 10 to 80 % by volume of a core made of the hydrophobic material, based on the total volume of the microcapsules, and a polymer shell surrounding the core, and have a particle size of 100 to 2,500 nm.

76. (New) The microcapsules of claim 72, wherein the microcapsules are composed of 10 to 80 % by volume of a core made of the hydrophobic material, based on the total volume of the microcapsules, and a polymer shell surrounding the core, and have a particle size of 100 to 2,500 nm.

77. (New) The microcapsules of claim 73, wherein the microcapsules are composed of 10 to 80 % by volume of a core made of the hydrophobic material, based on the total volume of the microcapsules, and a polymer shell surrounding the core, and have a particle size of 100 to 2,500 nm.

78. (New) The microcapsules of claim 74, wherein the microcapsules are composed of 10 to 80 % by volume of a core made of the hydrophobic material, based on the total volume of the microcapsules, and a polymer shell surrounding the core, and have a particle size of 100 to 2,500 nm.

79. (New) The microcapsules of claim 71, wherein the microcapsules are hollow, gas-filled microcapsules in which the hydrophobic material is removed.

80. (New) The microcapsules of claim 72, wherein the microcapsules are hollow, gas-filled microcapsules in which the hydrophobic material is removed.

81. (New) The microcapsules of claim 73, wherein the microcapsules are hollow, gas-filled microcapsules in which the hydrophobic material is removed.

82. (New) The microcapsules of claim 74, wherein the microcapsules are hollow, gas-filled microcapsules in which the hydrophobic material is removed.